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LETHAL DOSES OF SEVERAL COMMERCIAL CHEMICALS FOR FINGERLING CHANNEL CATFISH

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United States Department of the Interior, Fred A. Seaton, Secretary
Fish and Wildlife Service, Arnie J. Suomela, Commissioner

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The data in the following table were collected during the screening of several chemicals to determine the toxicity of some of those in use or that might be useful in various phases of channel catfish culture. The information reported should be useful to fishery workers interested in control of diseases, parasites, aquatic vegetation, and pollution of our streams and lakes. We have not yet tested the effectiveness of these chemicals for these control purposes.

Experiments were conducted in a manner identical with those previously reported [1/], with the exception of chemicals marked with an asterisk in table 1. In these tests, 4-gallon aquariums were used instead of quart jars, and 10 channel catfish fingerlings, 2 to 3 inches long, were placed in each aquarium. The diluent in all cases was tap water of the University of Oklahoma, and its chemical analysis was reported in the paper referred to above. One hundred or two hundred fish were used in each experiment, 10 fish at each concentration. All concentrations are reported as parts per million (p.p.m.) by weight of material as it came from the bottle except that chlordane, acetic acid, Chem-Fish Special, sodium arsenite, toxaphene, sodium pentachlorophenolate, and formalin were expressed as p.p.m. by volume.

We are grateful to the following companies who supplied the various chemicals in addition to others which have not yet been tested: American Cyanamid Company; Barada & Page, Inc.; California Spray Chemical Corporation; Carbide and Carbon Chemicals Company; Chemical Insecticide Corporation; Dow Chemical Company; E. I. du Pont de Nemours & Company; Mallinckrodt Chemical Works; Merck & Company, Inc.; Monsanto Chemical Company; and Thompson-Hayward Chemical Company.

1/ Clemens, Howard P., and Kermit E. Sneed. The chemical control of some diseases and parasites of channel catfish. U. S. Department of the Interior, Fish and Wildlife Service, Progressive Fish-Culturist, vol. 20, No. 1, 1958, pp. 8-15.

Table 1.--Limits of tolerance of fingerling channel catfish exposed to some chemicals used in fish management and in agriculture.

Chemical	Temperature (C°)	Lethal dose	Lethal doses in p.p.m. at various exposure time in hours							
			1	2	4	8	24	48	72	96
Acetic acid (by volume)	25°	LD_{100}	1256	629	629	629	629	629	629	---
		LD_{50}	889	446	446	446	446	388	270	---
		LD_0	629	315	315	315	315	15.8	15.8	---
Ammate	19°	LD_{100}	>500	>500	>500	500	500	316	250	250
		LD_{50}	>500	381	277	268	259	206	203	203
		LD_0	>500	199	158	158	158	158	158	158
Aramite 15%	20°	LD_{100}	>100	>100	>100	>100	>100	---	---	---
		LD_{50}	>100	>100	>100	>100	>100	---	---	---
		LD_0	>100	>100	>100	>100	>100	---	---	---
Atabrine	25°	LD_{100}	>2.0	>2.0	>2.0	>2.0	1.3	1.3	1.3	[2] 1.3
		LD_{50}	>2.0	>2.0	>2.0	[1] ≒2.0	0.93	0.89	0.89	[2] 0.8
		LD_0	>2.0	>2.0	>2.0	1.3	0.63	0.63	0.63	[2] 0.5
Baron	19°	LD_{100}	31.5	17.7	13.3	13.3	13.3	9.9	7.5	7.5
		LD_{50}	17.7	12.6	9.4	8.1	7.2	6.9	5.1	4.5
		LD_0	13.3	7.5	5.6	5.6	4.2	4.2	1.3	1.3
Ceresan M *	19°	LD_{100}	>20.0	---	[3] 7.9	7.9	2.0	2.0	2.0	2.0
		LD_{50}	>20.0	---	[3] 6.4	5.0	1.8	1.8	1.6	1.6
		LD_0	>20.0	---	[3] 5.0	1.3	1.3	1.3	1.3	1.3
Chem Ban	19°	LD_{100}	>225	>225	>225	>225	95.0	71.2	71.2	22.5
		LD_{50}	>225	>225	>225	>225	26.0	24.8	14.3	14.1
		LD_0	>225	>225	>225	>225	5.35	2.25	<1.69	<1.69
Chem-Fish Special (by volume)	25°	LD_{100}	>1.0	>1.0	---	[4] 1.0	1.0	1.0	1.0	1.0
		LD_{50}	0.70	0.70	---	[4] 0.56	0.56	0.56	0.56	0.56
		LD_0	0.42	0.42	---	[4] 0.42	0.42	0.42	0.42	0.42
Chem Mite	20°	LD_{100}	4.24	4.24	3.18	3.18	3.18	2.39	1.79	1.79
		LD_{50}	2.58	2.02	1.69	1.44	1.29	1.29	1.22	1.22
		LD_0	1.34	1.01	0.75	0.75	0.75	0.75	0.75	0.75
Chem Sen 56	20°	LD_{100}	>4000	2248	1266	400	[5] 127	127	95.0	71.0
		LD_{50}	>4000	1193	834	327	[5] 97.7	73.7	51.6	41.6
		LD_0	3007	712	400	225	[5] 71.2	40.0	<30.0	<30.0
Chlorax	20°	LD_{100}	>5000	5000	5000	5000	3759	3759	2110	1582
		LD_{50}	4452	4203	3968	3542	3157	2367	1410	1257
		LD_0	2809	2809	2809	2809	2110	1582	890	890
Chlordane (by volume)	25°	LD_{100}	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0
		LD_{50}	>2.0	≒2.0	≒2.0	1.33	0.74	0.50	0.50	0.50
		LD_0	>2.0	0.8	0.8	0.32	0.32	0.32	0.32	0.32

1/ "Nearly equal to".
2/ At 120 hours.
3/ At 5 1/2 hours.
4/ At 76 hours.
5/ At 30 hours.

Table 1.--Limits of tolerance of fingerling channel catfish exposed to some chemicals used in fish management and in agriculture. Continued.

Chemical	Temperature (C°)	Lethal dose	Lethal doses in p.p.m. at various exposure time in hours							
			1	2	4	8	25	48	72	96
CMU	20°	LD_{100}	>100	>100	>100	>100	>100	100	100	100
		LD_{50}	>100	>100	≒100	≒100	75.9	66.1	66.1	63.1
		LD_0	>100	>63.3	>63.3	>63.3	39.8	39.8	39.8	39.8
Copper disodium versenate	19°	LD_{100}	>4000	4000	3007	3007	2247	2247	2247	2247
		LD_{50}	>4000	2753	2599	2006	1881	1592	1373	838
		LD_0	>4000	2247	2247	1688	948	301	301	301
DDD *	20°	LD_{100}	>40.0	>40.0	>40.0	>40.0	15.8	6.4	<2.6	<2.6
		LD_{50}	>40.0	>40.0	>40.0	>40.0	<2.6	<2.6	<2.6	<2.6
		LD_0	>40.0	>40.0	>40.0	24.4	<2.6	<2.6	<2.6	<2.6
DDT 50% dust	19°	LD_{100}	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0
		LD_{50}	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0	>2.0
		LD_0	>2.0	>2.0	>2.0	>2.0	1.42	1.0	0.36	0.36
Delrad 70	25°	LD_{100}	>2.0	>2.0	1.6	1.3	1.0	1.0	1.0	1.0
		LD_{50}	>2.0	≒2.0	1.3	0.93	0.74	0.67	0.67	0.67
		LD_0	>2.0	1.6	1.0	0.79	0.50	0.32	0.32	0.32
Dieldrin 50 * wettable	19°	LD_{100}	>100	>100	>100	6.3	<2.5	<2.5	<2.5	<2.5
		LD_{50}	>100	>100	39.6	2.5	<2.5	<2.5	<2.5	<2.5
		LD_0	>100	>100	4.0	<2.5	<2.5	<2.5	<2.5	<2.5
Dilan *	19°	LD_{100}	>20.0	>20.0	>20.0	2.0	0.8	<0.5	<0.5	<0.5
		LD_{50}	>20.0	>20.0	1.08	<0.5	<0.5	<0.5	<0.5	<0.5
		LD_0	>20.0	>20.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-ethyl-1, 3-hexanediol	19°	LD_{100}	>871	871	871	871	871	871	871	871
		LD_{50}	>655	753	624	624	624	624	624	624
		LD_0	489	489	489	489	489	489	489	489
Fermate *	19°	LD_{100}	>20.0	>20.0	>20.0	>20.0	6/ 20.0	8.0	3.2	3.2
		LD_{50}	>20.0	>20.0	>20.0	>20.0	6/ 12.6	3.6	2.2	2.2
		LD_0	>20.0	>20.0	>20.0	>20.0	6/ 8.0	1.3	0.80	0.80
Ferrous disodium versenate	26°	LD_{100}	>500	>500	>500	>500	>500	>500	>500	>500
		LD_{50}	>500	>500	>500	>500	>500	>500	>500	>500
		LD_0	>500	>500	>500	>500	>500	>500	>500	>500
Formalin (by volume)	25°	LD_{100}	>500	500	316	199	126	126	126	126
		LD_{50}	500	263	165	138	87.0	69.0	69.0	69.0
		LD_0	316	126	126	79.0	50.0	50.0	50.0	50.0
Hept	19°	LD_{100}	222	124	70.0	53.0	30.0	12.0	12.0	12.0
		LD_{50}	149	86.5	53.4	33.9	12.4	≒9.0	≒9.0	≒9.0
		LD_0	124	70.0	40.0	22.0	<9.0	<9.0	<9.0	<9.0

6/ At 27 hours.

Table 1.--Limits of tolerance of fingerling channel catfish exposed to some chemicals used in fish management and in agriculture. Continued.

Chemical	Temperature (C°)	Lethal dose	Lethal doses in p.p.m. at various exposure time in hours							
			1	2	4	8	24	48	72	96
Heptachlor * 25%	19°	LD_{100}	>8.0	>8.0	>8.0	>8.0	5.1	7/ 3.2	8/ 2.0	2.0
		LD_{50}	>8.0	>8.0	>8.0	6.9	1.8	7/ 1.6	8/ 1.1	0.7
		LD_0	>8.0	>8.0	>8.0	2.0	0.5	7/ 0.5	8/ 0.5	0.5
IPC 50%	20°	LD_{100}	>100	>100	>100	>100	>100	>100	>100	>100
		LD_{50}	>100	>100	>100	>100	>100	89.0	86.5	86.5
		LD_0	>100	75.2	75.2	75.2	56.2	56.2	56.2	56.2
Isotox 25 wettable	19°	LD_{100}	1.58	1.58	1.58	9/ 0.89	0.89	0.89	0.89	0.66
		LD_{50}	0.89	0.74	0.61	9/ 0.57	0.54	0.52	0.49	0.45
		LD_0	0.37	0.37	0.37	9/ 0.21	0.21	0.21	0.21	0.21
Lexone	20°	LD_{100}	>50.0	50.0	50.0	25.0	10/ 12.6	12.6	12.6	12.6
		LD_{50}	≒50.0	22.3	22.0	13.3	10/ 5.6	5.0	3.8	3.4
		LD_0	25.0	4.5	3.5	2.5	10/ 0.63	0.63	0.63	0.63
Lignasan	19°	LD_{100}	>100	42.2	17.8	5.6	11/ 3.2	2.4	2.4	2.4
		LD_{50}	89.1	25.3	10.4	3.6	11/ 2.0	2.2	1.7	1.3
		LD_0	56.2	17.8	7.5	2.4	11/ 1.3	1.0	1.0	1.0
Lindane 3% Methoxychlor 50%	19°	LD_{100}	---	---	---	---	4.0	4.0	4.0	12/ 2.5
		LD_{50}	---	---	---	---	2.0	1.9	1.8	12/ 1.3
		LD_0	---	---	---	---	1.0	1.0	1.0	12/ 0.4
Malachite Green (oxalate salt)	25°	LD_{100}	1.0	0.50	0.25	0.25	0.19	0.19	0.19	0.19
		LD_{50}	0.79	0.31	0.20	0.17	0.14	0.14	0.14	0.14
		LD_0	0.40	0.25	0.16	0.10	0.10	0.10	0.10	0.10
Malathion * 25%	20°	LD_{100}	>100	>100	>100	>100	>100	>100	>100	>100
		LD_{50}	>100	>100	>100	>100	>100	57.3	52.2	52.2
		LD_0	>100	>100	61.0	39.5	39.5	16.0	16.0	16.0
Manganese disodium versenate	26°	LD_{100}	>500	>500	>500	>500	>500	>500	>500	>500
		LD_{50}	>500	>500	>500	>500	>500	>500	>500	>500
		LD_0	>500	>500	>500	>500	>500	>500	>500	>500
Manzate *	19°	LD_{100}	60.0	23.9	15.1	13/ 9.5	6.0	2.4	<1.5	<1.5
		LD_{50}	41.5	17.3	12.3	13/ 5.8	2.7	≒1.5	<1.5	<1.5
		LD_0	23.9	9.5	9.5	13/ 3.8	<1.5	<1.5	<1.5	<1.5
Neotran	19°	LD_{100}	>400	>400	>400	>400	>400	169.0	53.0	53.0
		LD_{50}	>400	>400	400	264	146	34.4	27.1	21.8
		LD_0	>400	>400	225	169	71.0	17.0	17.0	7.5
O-Cresol	21°	LD_{100}	---	---	---	---	---	---	14/ 100	15.8
		LD_{50}	---	---	---	---	---	---	14/ 66.8	11.2
		LD_0	---	---	---	---	---	---	14/ 15.8	4.0

7/ At 57 hours.
8/ At 77 hours.
9/ At 9 hours.
10/ At 30 hours.
11/ At 28 hours.
12/ At 269 hours.
13/ At 14 hours.
14/ At 69 hours.

Table 1.--Limits of tolerance of fingerling channel catfish exposed to some chemicals used in fish management and in agriculture. Continued.

Chemical	Temperature (C°)	Lethal dose	Lethal doses in p.p.m. at various exposure time in hours							
			1	2	4	8	24	48	72	96
Ortho-MH 30 Spray	19°	LD_{100}	>2.4	>2.4	>2.4	>2.4	>2.4	>2.4	2.4	---
		LD_{50}[9]	>2.4	>2.4	>2.4	>2.4	>2.4	1.7	0.01	---
		LD_0	>2.4	>2.4	>2.4	>2.4	0.61	.007	.007	---
Parzate (liquid)	19°	LD_{100}	>2258	358	143	143	143	143	57.0	57.0
		LD_{50}	66.3	66.3	52.7	35.2	21.1	19.8	18.5	14.3
		LD_0	23.0	23.0	14.0	14.0	9.0	9.0	9.0	0.9
Phenol	20°	LD_{100}	---	---	---	---	---	39.8	39.8	39.8
		LD_{50}	---	---	---	---	---	16.7	16.7	16.7
		LD_0	---	---	---	---	---	10.0	10.0	10.0
Phenylmercuric acetate (local)[15]	19°	LD_{100}	>25	>25	>25	14.1	5.9	[16]4.4	4.4	4.4
		LD_{50}	>25	>25	>25	9.1	4.1	[16]3.4	3.3	3.3
		LD_0	>25	>25	>25	5.9	3.3	[16]2.5	2.5	2.5
Phygon-XL	19°	LD_{100}	[17]>5.0	1.18	[18]0.50	0.28	[19]0.28	0.21	0.21	0.21
		LD_{50}	[17]>5.0	0.54	[18]0.26	0.18	[19]0.14	0.14	0.14	0.14
		LD_0	[17]>5.0	0.21	[18]0.12	0.05	[19]0.05	0.05	0.05	0.05
Potassium permanganate	25°	LD_{100}	36.4	12.9	9.1	---	4.6	---	---	---
		LD_{50}	27.2	8.8	5.2	---	<3.2	---	---	---
		LD_0	9.1	6.5	3.2	---	<3.2	---	---	---
Pyridylmercuric acetate	24°	LD_{100}	50.0	50.0	21.0	6.7	5.0	0.89	0.50	---
		LD_{50}	---	34.0	11.9	5.8	3.8	---	0.49	---
		LD_0	37.6	28.0	8.9	5.0	2.8	0.37	0.37	---
Quinine sulphate	23°	LD_{100}	>100	>100	75.2	75.2	56.2	56.2	42.2	42.2
		LD_{50}	>100	89.0	63.0	50.0	42.0	38.6	35.0	34.0
		LD_0	>100	75.2	42.2	31.6	31.6	31.6	23.7	23.7
Rivanol	20°	LD_{100}	13.3	10.0	---	5.6	4.2	4.2	4.2	4.2
		LD_{50}	9.7	5.8	---	3.2	2.8	2.7	2.7	2.7
		LD_0	5.6	4.2	---	1.8	1.8	1.8	1.8	1.8
Rotenone 5% cube	25°	LD_{100}	>1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		LD_{50}	0.91	0.60	0.58	0.54	0.51	0.47	0.47	0.47
		LD_0	0.56	0.32	0.18	0.18	0.18	0.18	0.18	0.18
Schadran	20°	LD_{100}	>8913	>8913	>8913	>8913	>8913	>8913	>8913	>8913
		LD_{50}	>8913	>8913	>8913	>8913	>8913	>8913	---	8150
		LD_0	>8913	>8913	>8913	>8913	>8913	8913	---	3760
Sodium arsentie (by volume)	25°	LD_{100}	>100	>100	>100	>100	75.0	31.6	31.6	31.6
		LD_{50}	>100	>100	>100	≒100	47.9	25.9	25.9	25.9
		LD_0	>100	>100	>100	42.0	24.0	17.8	17.8	17.8

15/ Prepared by the Chemistry Department, University of Oklahoma.
16/ At 45 hours.
17/ At 1 1/2 hours.
18/ At 4 hours.
19/ At 29 hours.

Table 1.--Limits of tolerance of fingerling channel catfish exposed to some chemicals used in fish management and in agriculture. Continued.

Chemical	Temperature (C°)	Lethal dose	Lethal doses in p.p.m. at various exposure time in hours							
			1	2	4	8	24	48	72	96
Sodium pentachlorophenolate (by volume)	25°	LD_{100}	>10.0	---	>10.0	>10.0	>10.0	>10.0	>10.0	>10.0
		LD_{50}	5.4	---	1.5	0.86	0.46	0.46	0.46	0.46
		LD_0	2.5	---	0.63	0.63	0.25	0.25	0.25	0.25
Sulfotepp *	19°	LD_{100}	>10.0	>10.0	>10.0	4.0	1.8	1.8	<1.0	<1.0
		LD_{50}	>10.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
		LD_0	7.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
TAG 10% solution	20°	LD_{100}	>40.0	16.9	5.3	4.0	2.3	1.3	1.3	0.95
		LD_{50}	>40.0	8.3	2.7	2.3	1.5	0.78	0.60	0.58
		LD_0	>40.0	3.0	1.3	1.3	0.95	0.40	0.40	0.40
TCA 90%	20°	LD_{100}	>2000	>2000	>2000	>2000	>2000	>2000	>2000	>2000
		LD_{50}	>2000	>2000	>2000	>2000	>2000	>2000	>2000	>2000
		LD_0	>2000	>2000	>2000	>2000	>2000	>2000	>2000	>2000
Tepp	19°	LD_{100}	>3.5	>3.5	>3.5	>3.5	3.5	2.6	2.6	2.6
		LD_{50}	>3.5	>3.5	>3.5	>3.5	2.3	1.7	1.6	1.6
		LD_0	>3.5	>3.5	>3.5	2.6	1.5	1.1	1.1	1.1
Thiram	19°	LD_{100}	>1.0	>1.0	>1.0	>1.0	>1.0	>1.0	1.0	1.0
		LD_{50}	>1.0	>1.0	>1.0	>1.0	>1.0	>0.63	0.79	0.79
		LD_0	>1.0	>1.0	>1.0	>1.0	0.63	0.63	0.63	0.63
Toxaphene (by volume)	20°	LD_{100}	>5.0	>5.0	>5.0	>5.0	>5.0	5.0	5.0	5.0
		LD_{50}	>5.0	>5.0	>5.0	≒5.0	2.5	1.9	1.9	1.9
		LD_0	>5.0	>5.0	>5.0	0.79	0.79	0.79	0.79	0.79
Trypaflavine (acriflavine hydrochloride)	20°	LD_{100}	>100	56.2	[20/]42.2	---	17.8	10.0	7.5	7.5
		LD_{50}	87.5	42.4	[20/]27.6	---	11.5	6.8	6.4	4.9
		LD_0	56.2	23.7	[20/]17.8	---	7.5	4.2	4.2	4.2
Versene acid	25°	LD_{100}	>500	>500	500	---	316	316	316	316
		LD_{50}	>500	>500	359	---	167	133	133	129
		LD_0	>500	>500	99.8	---	99.8	99.8	99.8	99.8
Versenol iron chelate	19°	LD_{100}	>2.2	>2.2	>2.2	>2.2	>2.2	[21/]2.2	2.2	2.2
		LD_{50}	>2.2	>2.2	>2.2	>2.2	1.9	[21/]1.3	1.3	1.3
		LD_0	>2.2	>2.2	>2.2	1.3	0.95	[21/]0.95	0.95	0.95
Zerlate *	19°	LD_{100}	>2.0	>2.0	>2.0	[22/]2.0	2.0	1.26	0.79	0.79
		LD_{50}	>2.0	>2.0	>2.0	[22/]1.1	1.0	0.73	0.58	0.50
		LD_0	>2.0	>2.0	>2.0	[22/]0.50	0.50	0.32	0.32	0.2
Zinc disodium versenate	26°	LD_{100}	>500	>500	>500	>500	>500	>500	>500	>500
		LD_{50}	>500	>500	>500	>500	>500	>500	>500	>500
		LD_0	>500	>500	>500	>500	>500	>500	>500	>500

20/ At 5 hours.
21/ At 57 hours.
22/ At 14 hours.

List OF CHEMICAL PREPARATIONS USED AND THE ACTIVE INGREDIENTS OF EACH

	Chemical or Trade Names	Active Ingredients
1.	Acetic acid	Glacial acetic acid
2.	Ammate	Ammonium sulfamate
3.	Aramite 15% (88R, alkyl aryl sulfite)	Product containing 2-(p-tert-butylphenoxy) isopropyl 2-chloroethyl sulfite, 15%
4.	Atabrine (dihydrochloride) (SN390, Mepacrine hydrochloride, Erion, Acriquine, Acrichine, Palacrin, Chinacrin hydrochloride, Metaquine, Italchin)	3-chloro-7-methoxy 9-(1-methyl-4-diethylaminobutylamino) acridine dihydrochloride
5.	Baron	2-(2, 4, 5-trichlorophenoxy)ethyl 2, 2-dichloroproprionate, 30.5%, related compounds 10.8%
6.	Ceresan M	Ethyl mercury p-toluene sulfonanilide, 7.7% (total mercury as metallic 3.2%)
7.	Chem Ban	Not available
8.	Chem-Fish Special	Rotenone, other cube extractives, methylated naphthalene, and others, 64.7%
9.	Chem Mite	Xylene, p-chlorophenol, p-chlorobenzene sulphonate, rotenone, and other cube resins, 79%
10.	Chem Sen 56	Active ingredients, 72.5%, incl. sodium arsenite (total arsenic, all in water soluble form, expressed as metallic, 42.0%)
11.	Chlorax "40"	Sodium chlorate, 40%; sodium metaborate, 58%
12.	Chlordane (Velsicol 1068, Octachlor, Octa-Klor)	1, 2, 4, 5, 6, 7, 8, 8-octachloro-2, 3, 3a, 4, 7, 7a-hexahydro-4, 7-methanoindene
13.	CMU (Karmex, Monuron)	3-(p-chlorophenyl)-1, 1-dimethylurea, 80%
14.	Copper disodium versenate	Copper disodium salt of ethylenediaminetetraacetic acid; 9% Cu ions
15.	DDD (Rhothane, TDE)	Dichloro-diphenyl-dichloroethane, 50%
16.	DDT, 50% dust (Chlorophenothane)	Dichloro-diphenyl-trichloroethane, 50%
17.	Delrad 70 (RADA)	Rosin amine D acetate or technical abietylamine acetates, 70%

	Chemical or Trade Name	Active Ingredients
18.	Dieldrin 50 (Compound 497)	1, 2, 3, 4, 10, 10-hexachloro-6, 7-epoxy-1, 4, -4a, 5, 6, 7, 8, 8a-octahydro-1, 4, 5, 8-dimethanonaphthalene, 42.5%
19.	Dilan (CS-708)	Mixture of 1 part 1, 1-bis (p-chlorophenyl)-2-nitropropane (CS-645A), and 2 parts 1, 1-bis (p-chlorophenyl)-2-nitrobutane (CS-674A)
20.	2 ethyl-1, 3-hexanediol (Rutgers 612, ethohexadiol)	-2-ethyl-3-propyl-1, 3-propanediol, 100%
21.	Fermate (Ferbam, Kerbam)	Ferric dimethyldithiocarbamate, 76%
22.	Ferrous disodium versenate (Ferro-Grene)	Iron as metal, 8%
23.	Formalin (Formol)	A solution of about 37%, by weight, of formaldehyde gas in water; usually with 10-15% methanol added.
24.	Hept	Dichloro diphenyl dichloroethane, 50%
25.	Heptachlor 25% (Velsicol 104, E-3314)	1 (or 3a), 4, 5, 6, 7, 8, 8-heptachloro-3a, 4, 7, 7a-tetrahydro-4, 7-methanoindene, 25%. Related ingredients, 9.72%. Inert, 65.28%
26.	1 PC-50% (INPC)	o-isopropyl n-phenyl carbamate, 50%
27.	Isotox 25, wettable	gamma isomer of benzene hexachloride (from lindane), 25%
28.	Lexone	gamma isomer of benzene hexachloride, 10%; other isomers, 47%
29.	Lignasan	Ethyl mercury phosphate, 6.25%
30.	Lindane 3% methoxychlor, 50% (marlate, DMDT)	gamma isomer of benzene hexachloride of not less than 99% purity. 1, 1, 1-trichloro-2, 2-bis (p-methoxyphenol) ethane.
31.	Malachite Green (oxalate salt) [Aniline Green, China Green, Victoria Green B or WB, New Victoria Green Extra 0, I, or II, Diamond Green B, Bx or P Extra, Solid Green 0, Light Green N; Benzal Green, Benzadehyde Green, Fast Green]	Zinc oxalate of tetramethylpara-aminotriphenylcarbinol
32.	Malathion 25%	0, 0-dimethyl S-(1, 2-dicarboethoxyethyl) dithiophosphate (XXII), or S-(1, 2-dicarbethoxyethyl) 0, 0-dimethyl phosphorodithioate.
33.	Manganese disodium versenate	Manganese disodium salt of ethylenediaminetetraacetic acid; 8% Mn ions

	Chemical or Trade Name	Active Ingredients
34.	Manzate	Manganese ethylene bis-dithiocarbamate, 70% (manganese equivalent as metallic 14.5%)
35.	Neotran (K-1875)	Bis (b-chlorophenoxy)-methane; 40% of di(4-chloro-phenoxy)-methane
36.	O-Cresol	o-cresylic acid or o-hydroxytoluene
37.	Ortho-MH30 spray	Diethanolamine salt of 1, 2-dihydropyridazine-3, 6-dione, 58%; malic hydroxide equiv., 30%
38.	Parzate Nabam (liquid)	Disodium ethylenebisdithiocarbamate, 19%
39.	Phenol	Same (carbolic acid)
40.	Phenylmercuric acetate (local)	Same
41.	Phygon-XL (Dichlone)	2, 3-dichloro-1, 4-naphthoquinone, 50%
42.	Potassium permanganate (Chameleon mineral)	Same
43.	Pyridylmercuric acetate (PMA)	Same; active ingredient, 80%
44.	Quinine sulphate (Quinine)	Same
45.	Rivanol	6, 9-diamino-2-ethoxyacridine, or 2-5-diamino-7-ethoxyacridine
46.	Rotenone 5%, cube	Rotenone, 5%; β-toxicarol, 50-60%; β-deguelin, 12%; sumatrol, 5-15%; fats, waxes, and acids, 10%; unaccounted for, 8-11%
47.	Schadran (OMPA, Pestox 111)	Octamethyl pyrophosphoramide
48.	Sodium arsenite	Sodium meta-arsenite
49.	Sodium pentachlorophenolate	Same, 83%; other chlorophenols, 12%
50.	Sulfotepp (dithione)	Tetraethyl dithiopyrophosphate
51.	Tag 10% solution	Phenylmercuric acetate, 10%
52.	T.C.A. 90% (sodium TCA)	Sodium trichloracetate, 90% (trichloracetic acid equivalent, 79.3%)
53.	Tepp (Tep)	Tetraethylpyrophosphate, 40%; other ethyl phosphates, 60%
54.	Thiram (Arasan)	Tetramethylthiuram disulfide, 99%
55.	Toxaphene (Compound 3956)	Chlorinated camphene, having a chlorine content of 67-69%

	Chemical or Trade Name	Active Ingredients
56.	Trypaflavine (acriflavine hydrochloride, acid trypaflavine, flavine)	A mixture of hydrochlorides of 2, 8-diamino-10-methylacridinium chloride, and 2, 8-diaminoacridine, and containing from 23-24.5% chlorine and about 14.2% nitrogen
57.	Versene acid	Ethylenediaminetetraacetic acid
58.	Versenol iron chelate	Tri-sodium salt of N-hydroxyethylethylenediaminetriacetic acid; chelate compound 57%; iron, expressed as metal, 9% (equivalent to iron expressed as Fe_2O_3, 12.9%)
59.	Zerlate (Ziram) Zimate	Zinc dimethyldithiocarbamate, 76% (total zinc, as metallic, 16.2%)
60.	Zinc disodium versenate	Zinc disodium salt of ethylenediaminetetraacetic acid; 8.6% zinc ions

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